Surgical Site Infection (SSI) Prevention

Basics of Infection Prevention
2-Day Mini-Course
October-November 2011

Objectives

- Review the epidemiology of SSI
- Explore causes and mechanisms of SSI
- Describe evidence-based practices for prevention of SSI
- Review SSI surveillance definitions and methods

Epidemiology of SSI

- SSI = infection within 30 days after operation (or one year if implant) and appears related to the surgery
- 2% -5% surgical patients acquire SSI (300-500K per year)
  - 3% die (77% of deaths directly attributable to the SSI)
  - Many result in long term disability
- SSI increases hospital length of stay 7-10 days
  - Cost estimates vary, ~$30,000 per SSI
  - Most estimates do not account for rehospitalization, outpatient treatment, post-discharge expenses, or any long term disability costs

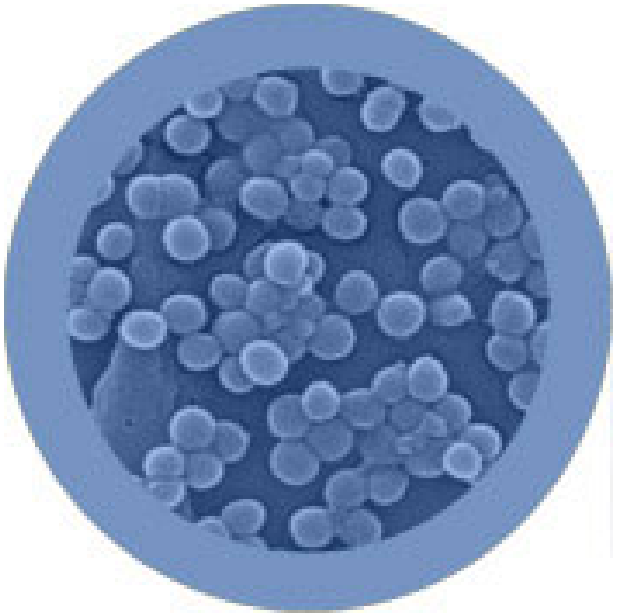
Pathogenesis of SSI

Source of infecting pathogen

- Endogenous
  - Patient Flora
    - Skin
    - GI tract
    - Mucous membranes
  - Seeding from pre-existing sites of infection
- Exogenous
  - Surgical personnel flora
  - Breaks in aseptic techniques
  - Inadequate hand hygiene
  - Contaminated garments
  - Equipment, surgical tools, materials within operative field
  - OR environment, including ventilation

SSI Pathogens

- *Staphylococcus aureus* - 30.0%
- Coagulase-negative staphylococci - 13.7%
- Enterococcus spp - 11.2%
- *Escherichia coli* - 9.6%
- *Pseudomonas aeruginosa* - 5.6%
- Enterobacter spp - 4.2%
- *Klebsiella pneumonia* - 3.0%
- Candida spp - 2.0%
- *Klebsiella oxytoca* - 0.7%
- *Acinetobacter baumannii* - 0.6%



N=7,025
Jan 2006-Oct 2007

HidronAI, et.al., *Infect Control Hosp Epidemiol* 2008;29:996-1011 ;ERRATUM 30:107–107

SSI Prevention Objectives

- National HAI Prevention Action Plan
  - SSI reduction of 25% from 2009 baseline
  - 95% adherence rates to Surgical Care Improvement Project (SCIP) process measure

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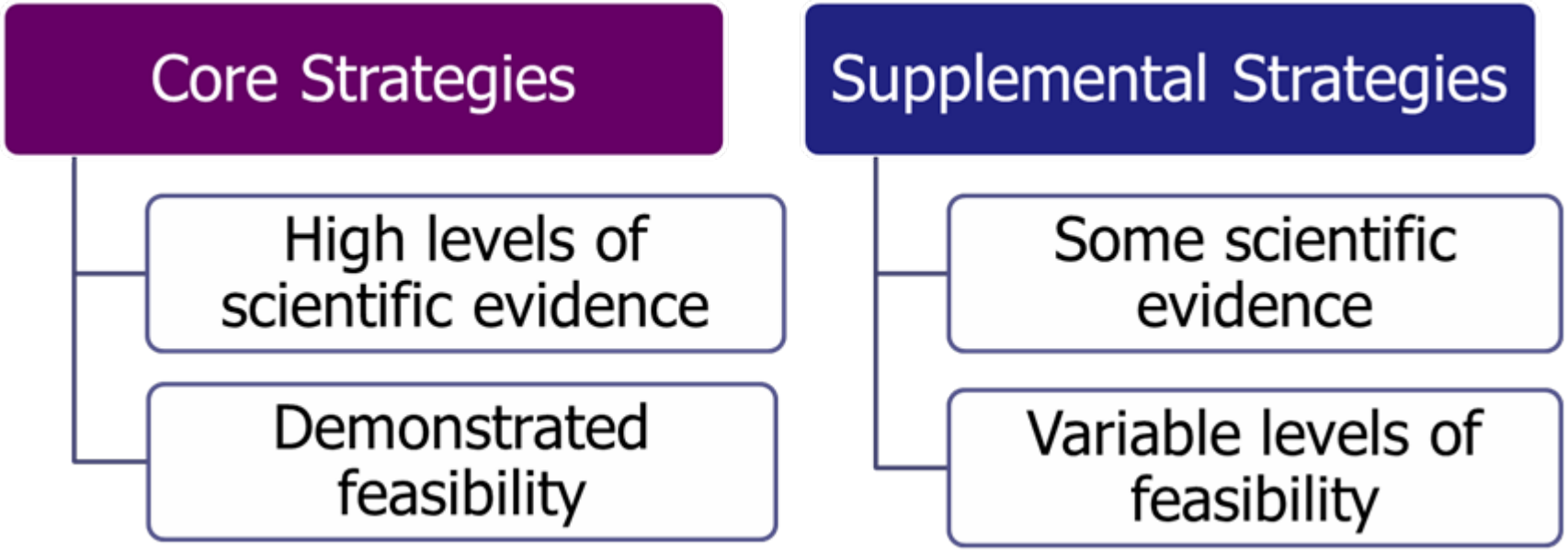
To review

CDC Prevention Strategies



- Should become standard practice

- Consider implementing <u>in addition to Core</u> when infections persist or rates are high

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SSI Prevention Strategies: **Core**

Administer antimicrobial prophylaxis in accordance with evidence based standards and guidelines

- Administer within 1-hour prior to incision
  (2hr for vancomycin and fluoroquinolones)
- Select appropriate agents on basis of:
  - Surgical procedure
  - Most common SSI pathogens for the procedure
  - Published recommendations
- Discontinue antibiotics within 24hrs after surgery
  (48 hrs for cardiac)

SSI Prevention Strategies: **Core**

- Identify and treat remote infections – when possible
  - Before elective operation
  - Postpone operation until infection resolved
- Hair removal
  - Do not remove hair at the operative site unless it will interfere with the operation
  - Do not use razors
    - If necessary, remove by clipping or by use of a depilatory agent

SSI Prevention Strategies: **Core**

- Skin Prep
  - Use appropriate antiseptic agent and technique for skin preparation

- Operating Room (OR) Traffic
  - Keep OR doors closed during surgery except as needed for passage of equipment, personnel, and the patient

SSI Prevention Strategies: **Core**

- Colorectal surgery patients
  - Mechanically prepare the colon (Enemas, cathartic agents)
  - Administer non-absorbable oral antimicrobial agents in divided doses on the day before the operation

- Maintain immediate postoperative normothermia

Prevention Strategies: **Core**

- Surgical Wound Dressing
  - Protect primary closure incisions with sterile dressing for 24-48 hours post-op
- Control blood glucose level during the immediate post-operative period - cardiac
  - Measure blood glucose level at 6 am on post-op day 1 and 2 (procedure day = day 0)
  - Maintain post-op blood glucose level at <200mg/dL

SSI Prevention Strategies: **Supplemental**

- Nasal screen *Staphylococcus aureus* patients undergoing
  - elective cardiac surgery, orthopedic, neurosurgery procedures with implants
  - decolonize carriers with mupirocin prior to surgery
- Screen preoperative blood glucose levels and maintain tight glucose control post-op day 1 and 2 in patients undergoing select elective procedures
  - i.e. arthroplasties, spinal fusions, etc.

NOTE: These supplemental strategies are not part of the 1999 HICPAC Guideline for Prevention of Surgical Site Infections

Prevention Strategies: **Supplemental**

- Redose antibiotic at 3 hr intervals in procedures with duration >3 hours
  - *See exceptions to this recommendation in Engelmann, 2007 ,
- Adjust antimicrobial prophylaxis dose for obese patients (body mass index >30)
- Use at least 50% fraction of inspired oxygen intraoperatively and immediately postoperatively in select procedure(s)

SSI Prevention Strategies: **Supplemental**

- Perform surveillance for SSI
- Feedback surgeon-specific infection rates

Identifying SSI

- Follow NHSN protocols for surveillance
- Surgical services, surgical units, and OR staff need to assist
- Evaluate surgical patients during hospital stay
  - Rounds on units
  - Pharmacy reports of antimicrobial use
  - Temperature charts / logs
  - Operating room schedule of surgeries/ re-operations
- Evaluate positive wound cultures from post-op patients
  - Can't rely on wound cultures alone to find SSI (!)
- Monitor surgical patients for re-admission
- Perform post-discharge surveillance

SSI Post-discharge Surveillance

Examples

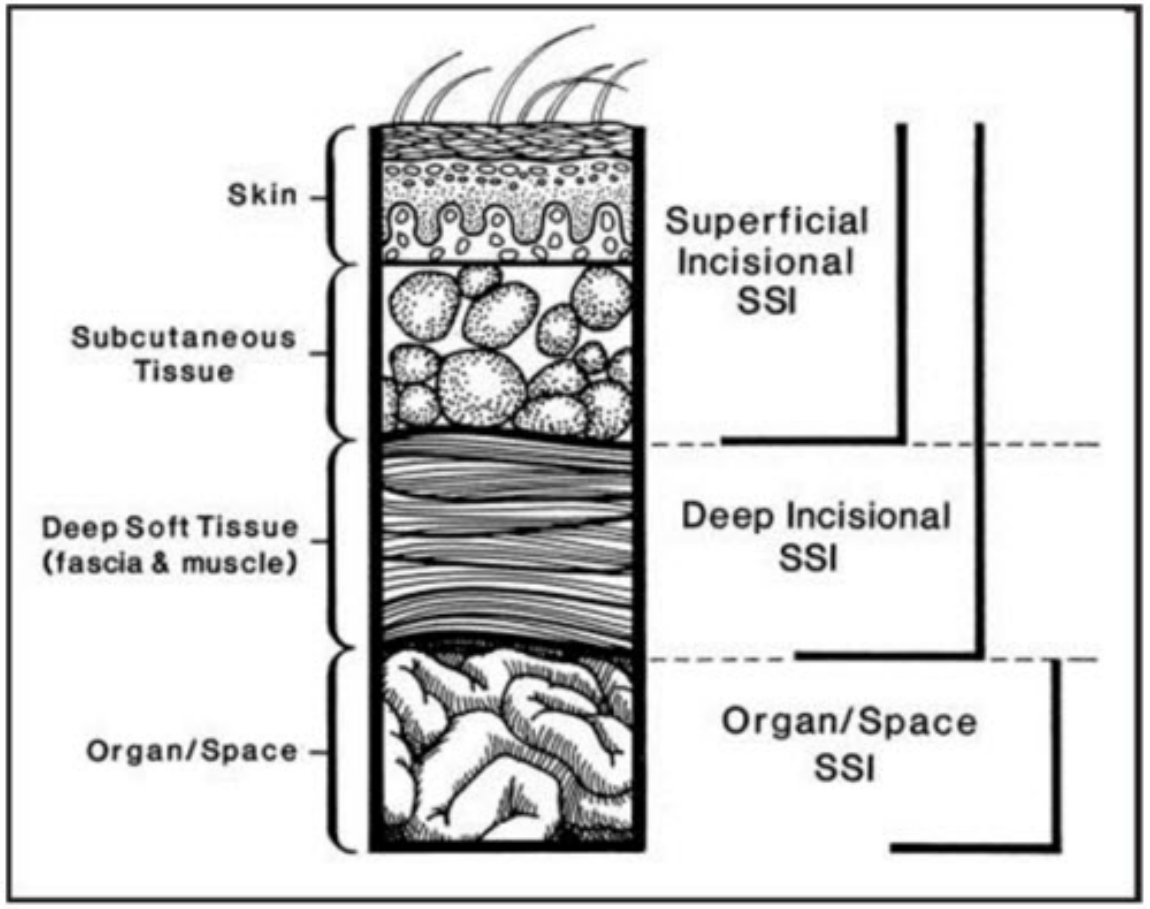
- Readmissions to *other* hospitals
- Emergency department or clinic records
- Health system laboratory and pharmacy records
- Surgeon surveys by phone, mail or FAX
- Patient surveys (less reliable)

Interpreting SSI Surveillance

Requires

- Consistent use of standard methods and definitions for identifying SSI cases
- Capture of sufficient risk factor data for each procedure performed
- Application of risk adjustment methods for meaningful comparisons (i.e. over time within your hospital or to national referent data)

NHSN SSI Surveillance Definition



Categorized based on depth infection

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Superficial Incisional SSI

Surveillance Definition

- ❑ Infection occurs within 30 days after surgical procedure

AND

- ❑ Involve only skin and subcutaneous tissue of the incision

AND

Patient has at least **1:**

- ❑Purulent drainage from incision
- ❑Organism isolated from incision culture or fluid (obtained aseptically)
- ❑Pain or tenderness
- ❑Localized swelling, redness, or heat

AND ❑ Incision opened by surgeon and found to be culture positive or was not cultured

- ❑Diagnosis of superficial SSI by surgeon or attending physician

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Deep Incisional SSI

Surveillance Definition

- Infection occurs within 30 days after surgical procedure if no implant or within 1 year if implant

AND

- Involves deep soft tissues of the incision, e.g. fascial & muscle layers

AND

Patient has at least **1:**

- Purulent drainage from deep incision but not from the organ/space of the surgical site
- Deep incision spontaneously dehisces or opened by surgeon **AND** is culture positive or not cultured **AND** fever >38°C, localized pain, or tenderness
- Abscess or evidence of deep infection found on direct exam, during reoperation, by histopathologic or radiologic exam
- Diagnosis of deep SSI by surgeon or attending physician

Organ Space SSI

Surveillance Definition

- Infection occurs within 30 after surgical procedure if no implant or within 1 year if implant

AND

- Involves any part of body that is opened or manipulated during the surgical procedure; excludes skin, fascia, or muscle layers, and subcutaneous tissue of the incision

AND

Patient has at least **1:**

- Purulent drainage from drain placed through stab wound into organ/space
- Organism isolated from incision culture or fluid (obtained aseptically)
- Abscess or evidence of organ/space infection found on direct exam, during reoperation, by histopathologic or radiologic exam
- Diagnosis of deep SSI by surgeon or attending physician

Procedure Risk Factor Data

For all procedures

- Gender
- Age
- Surgical wound class -
  clean, clean-contaminated, contaminated, or dirty
- ASA score **- as proxy for underlying illness**
- Duration - incision to close time
- Yes/No: Emergency, Trauma, Implant, Anesthesia type
- Endoscope *(decreases risk)*
- ~~Non-autologous transplant~~ (Won't be required beginning Jan 2012)

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Procedure Risk Factor Data

For specific procedures

C-section

- Height
- Weight
- Duration of labor
- ~~Est. blood loss~~

(Won't be required beginning Jan 2012)

Spinal fusion/refusion

- Spinal level (e.g. cervical)
- Diabetes Y/N
- Approach (e.g. anterior)

Hip prosthesis

- Total or partial
- Primary or revision

Knee prosthesis

- Primary or revision

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Interpreting SSI Data

To make comparisons of SSI, use a number called an SIR (standardized infection ratio)

$$SIR = \frac{\text{Observed SSI}}{\text{Predicted SSI}}$$

1.0 indicates your hospital is the same as national comparison data

More coming in Epi/Surv presentation

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SSI Prevention Collaboratives and Bundles

- CDC (Center for Disease Control)
  hwww.cdc.gov/HAI/recoveryact/stateResources/toolkits
- IHI (Institute for Healthcare Improvement)
  www.ihi.org/offerings/MembershipsNetworks/MentorHospitalRegistry/Pages/InfectionPreventionSSI
- SCIP (Surgical Care Improvement Project)
  www.qualitynet.org/dcs/
- WHO (World Health Organization)
  www.who.int/patientsafety/safesurgery/en/

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References and Resources

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Questions?

For more information, please contact any Liaison Team member.

Thank you